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Asakaze

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(54) **OUTBOARD MOTOR**

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(73) Assignee: **Yamaha Marine Kabushiki Kaisha**, Shizuoka-ken (JP)

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B63H 23/34 (2006.01)

(52) **U.S. Cl.** **440/83**

(58) **Field of Classification Search** 440/83
See application file for complete search history.

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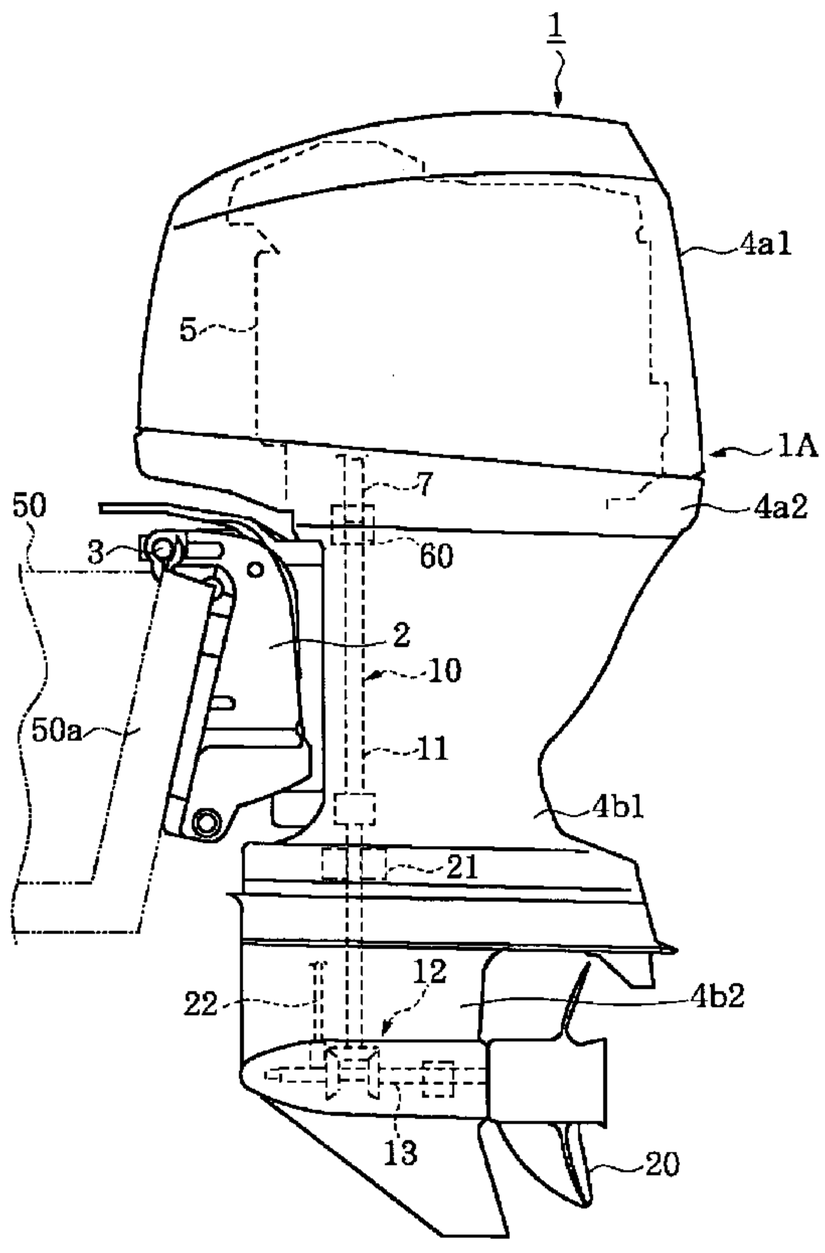
(57) **ABSTRACT**

An outboard motor cam have a power transmission mechanism for transmitting rotational power of a crankshaft of an engine to a propeller through a drive shaft, an advancing/reversing-switching mechanism and a propeller shaft, and adapted to be propelled by the propeller being driven for rotation. A torque variation-absorbing device can be disposed in a coupling section between the crankshaft and the drive shaft, and supported through bearings.

9 Claims, 9 Drawing Sheets



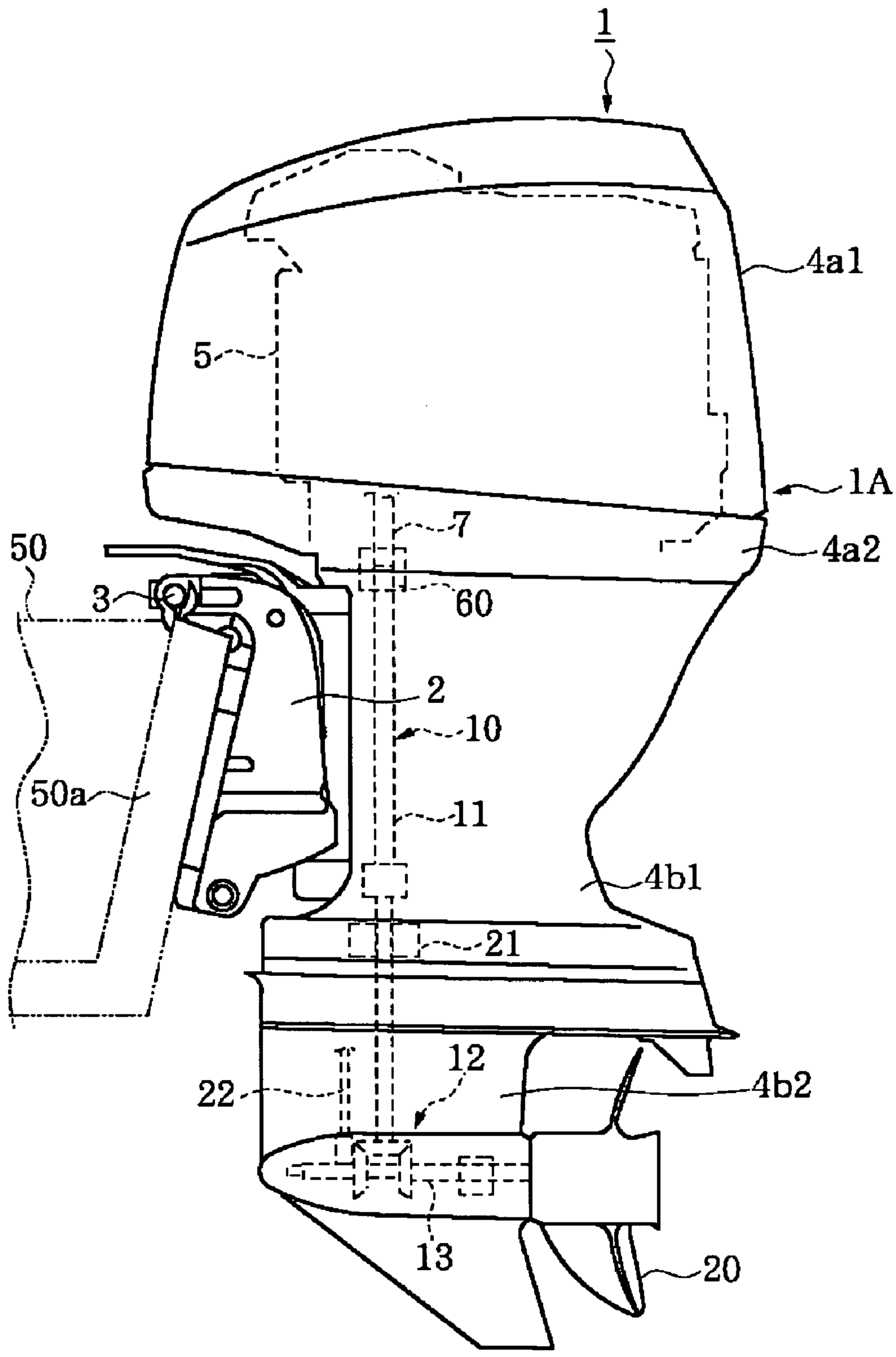
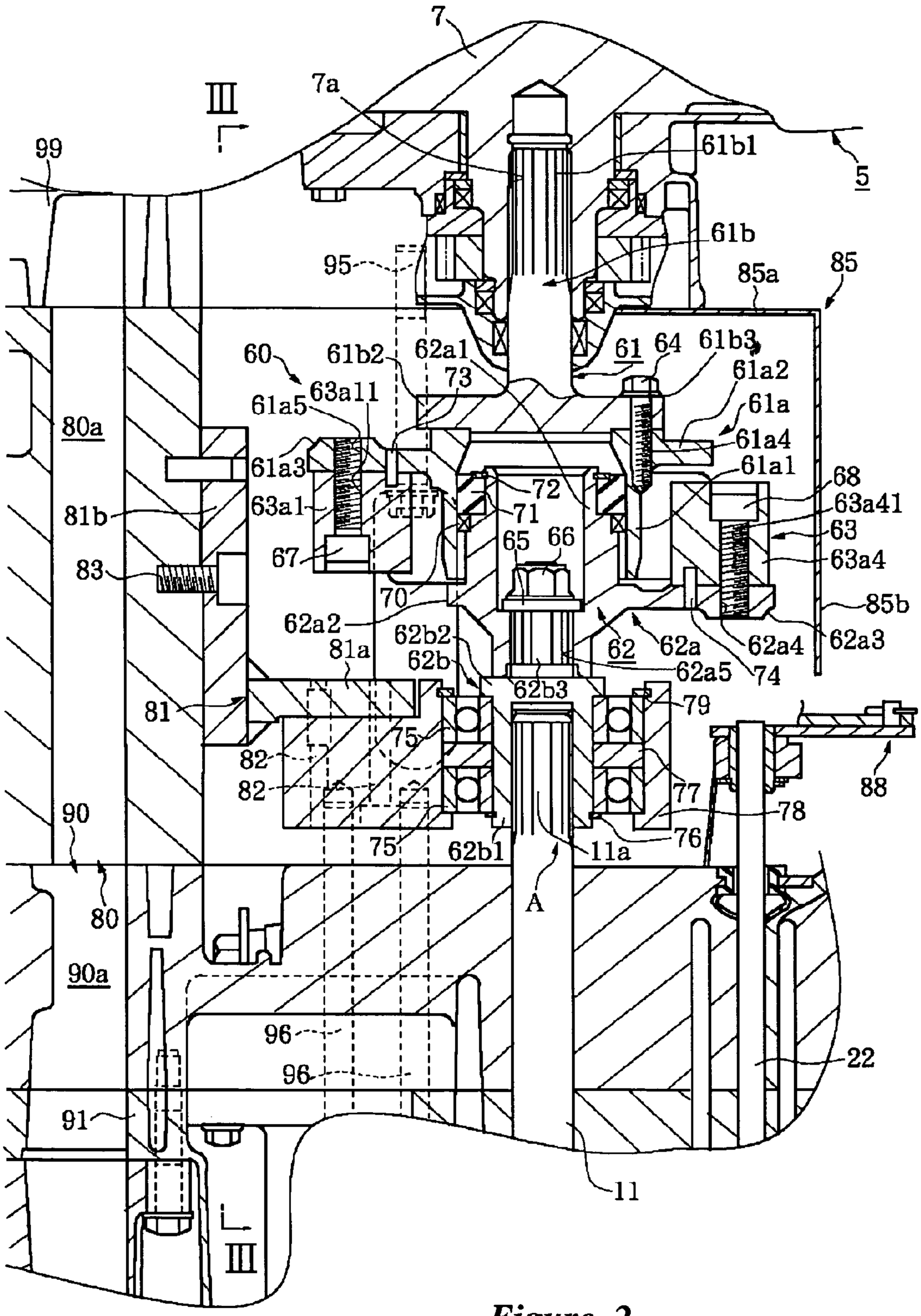


Figure 1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60
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61a5
63a11
61a
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80a
61a3
61a1
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63a41
81b
63a1
71
63
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63a4
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62a2
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82
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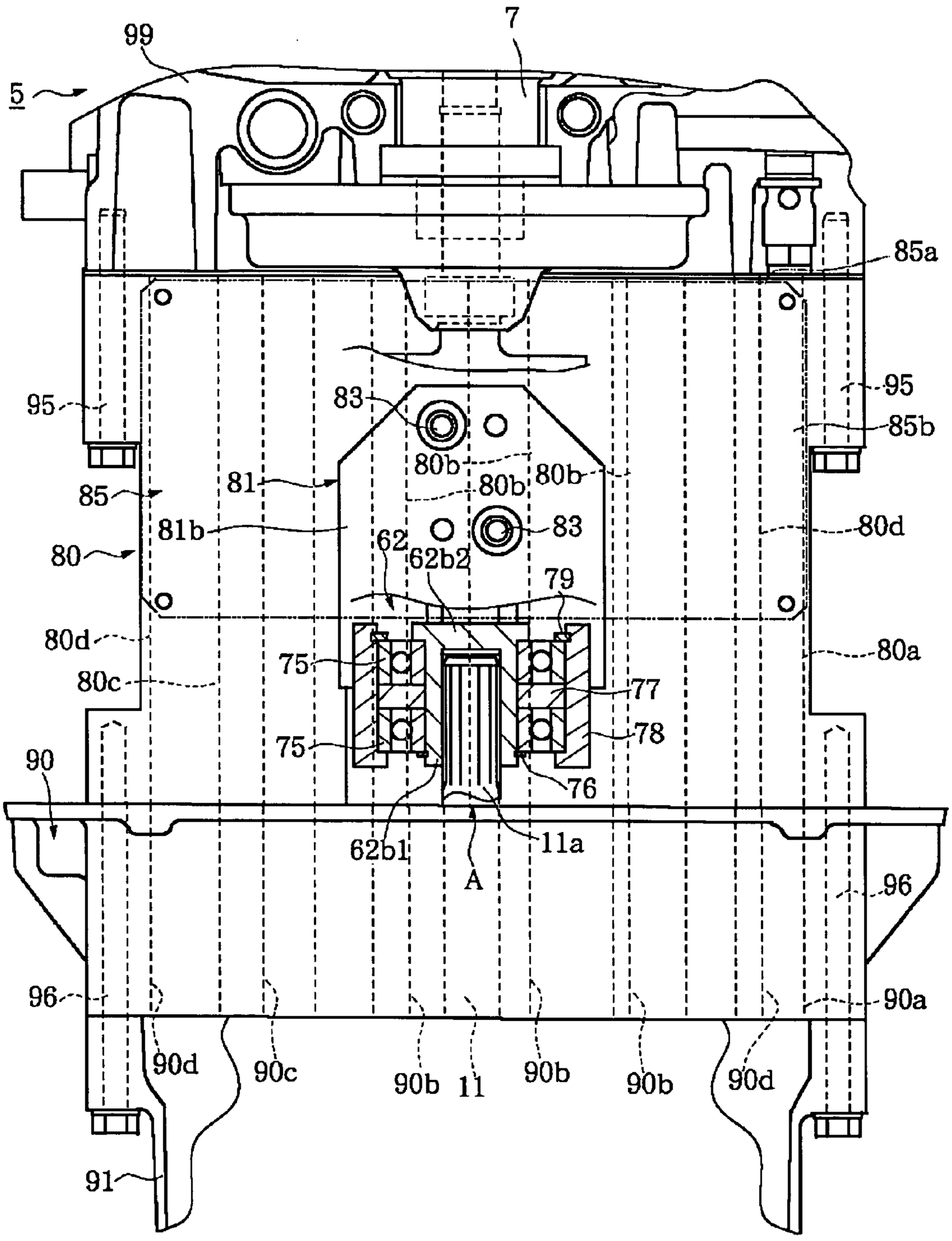
22
91
11
III

Figure 2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81
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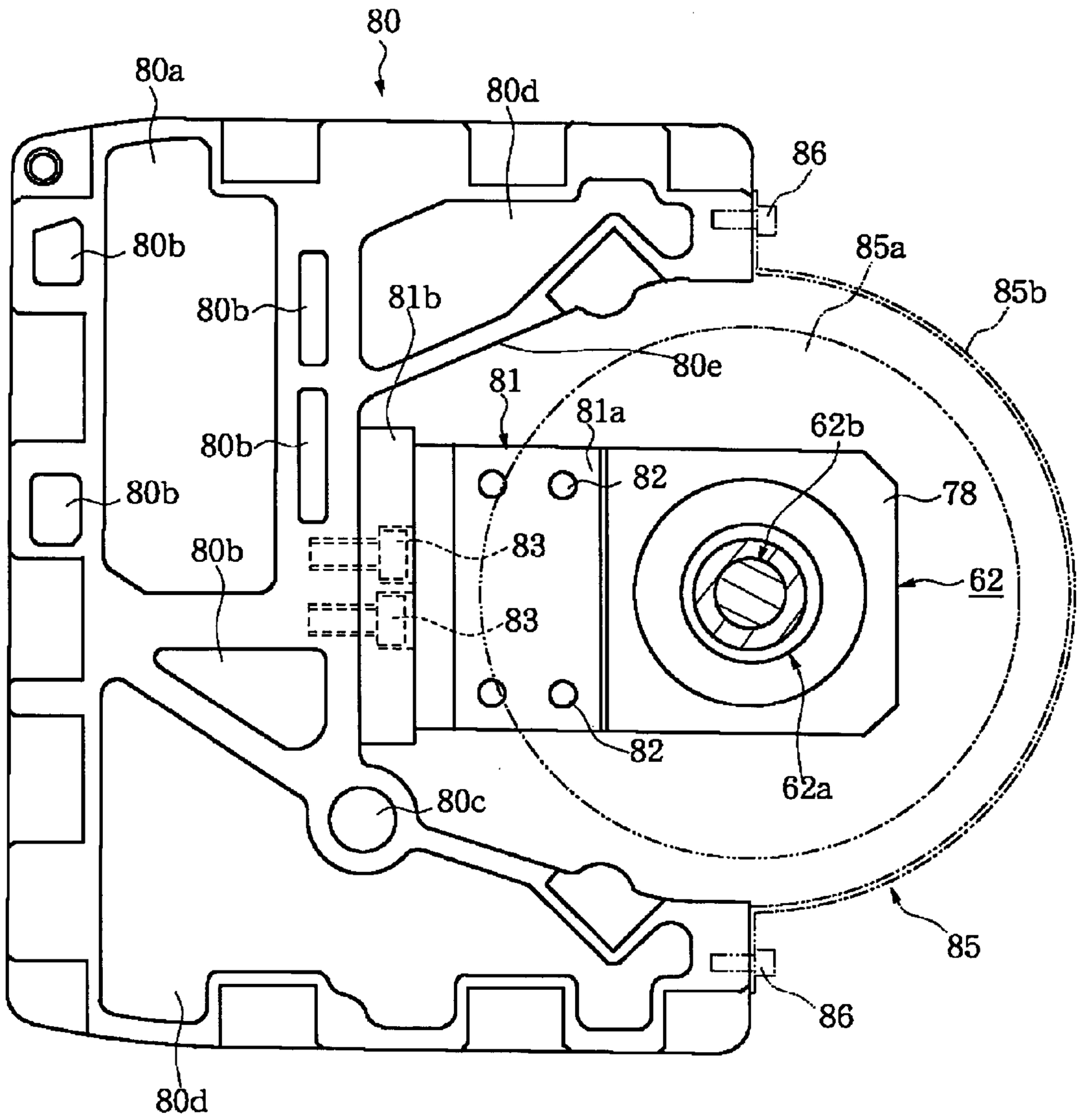
75
77
80c
78
75
90
76
62b1
A
11a
96
90a
90d
90c
90b
11
90b
90b
90d
91

Figure 3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81a
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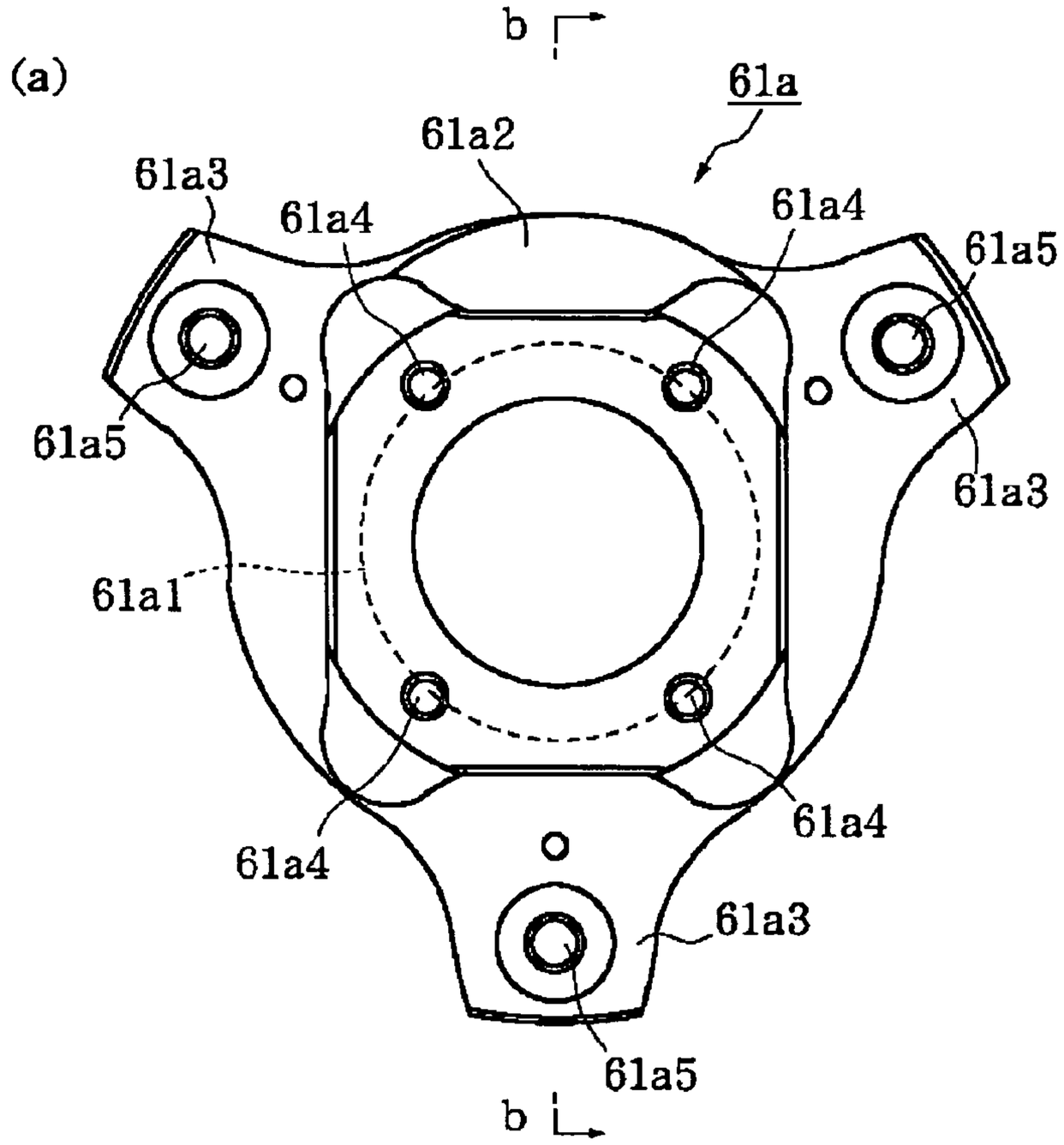
80b
82
62a
80c
85
86
80d

Figure 4


(a)
b
61a
61a2
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61a4
61a5
61a5
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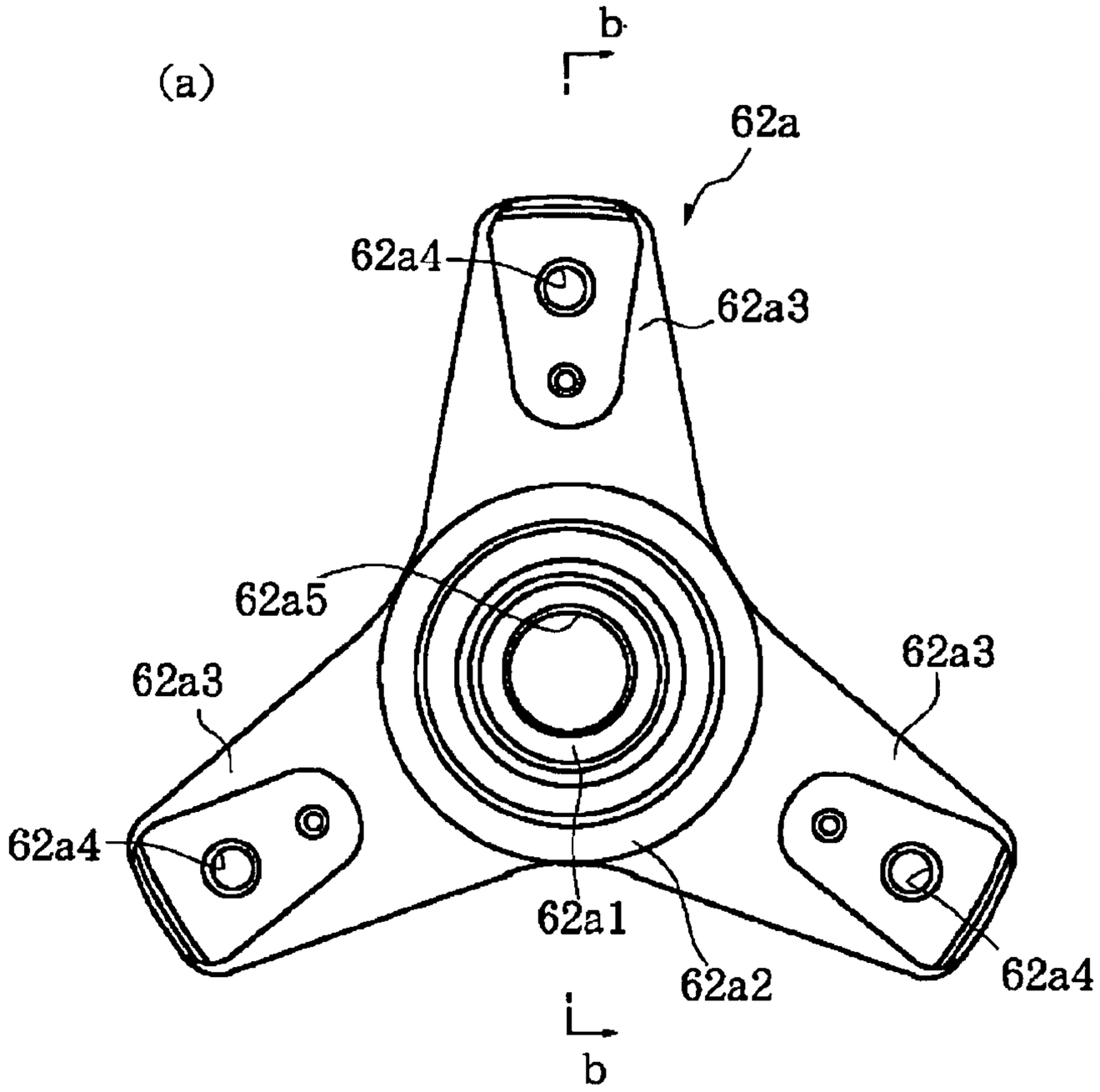
61a1
61a4
61a4
61a3
61a5
b
(b)
61a
61a2
61a1
61a4
61a5
61a3

Figure 5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(b)
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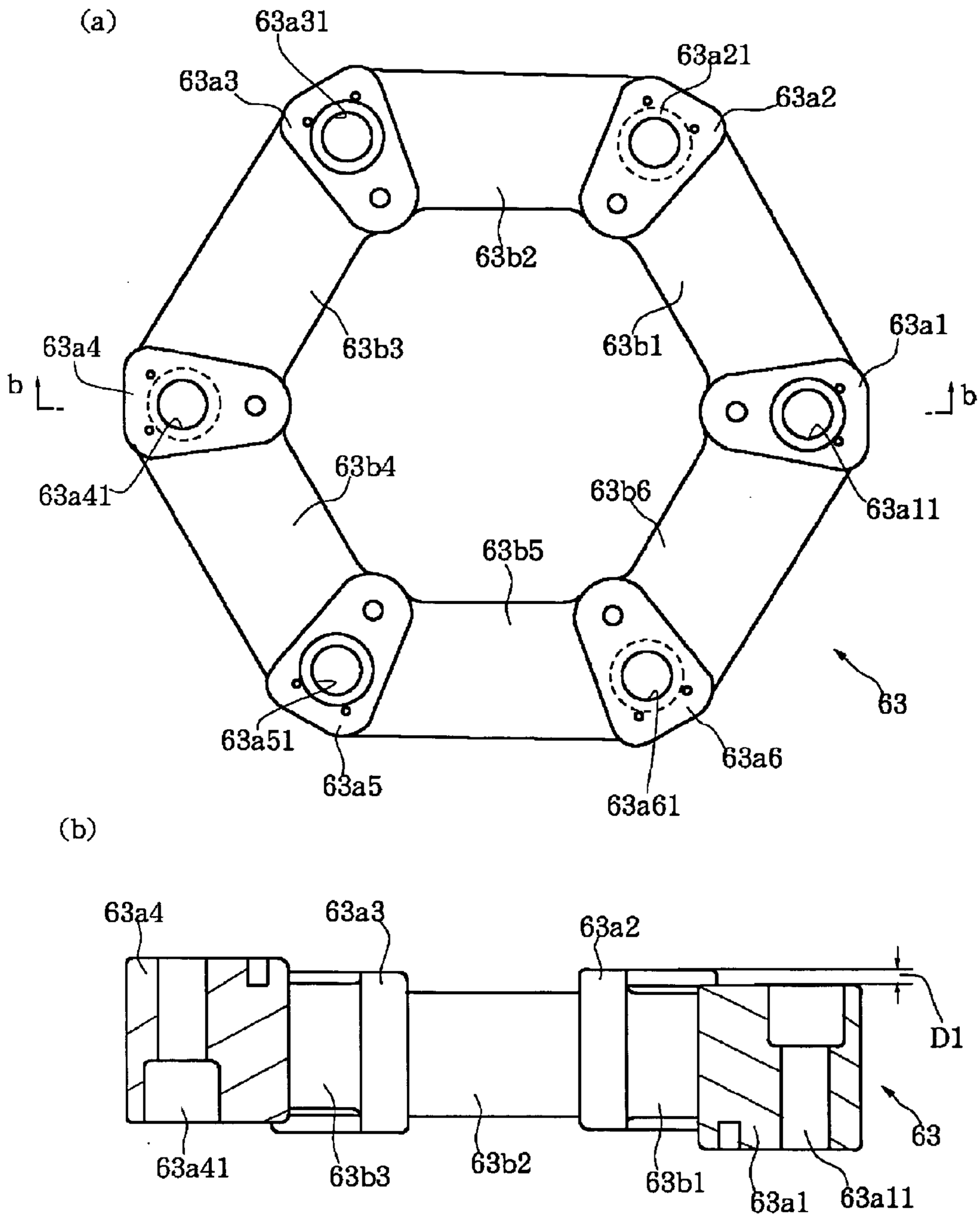
62a4
62a1
62a5
62a2

Figure 6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63b6
63a11
63b5
63a51
63a5
63a6
63a61
63
(b)
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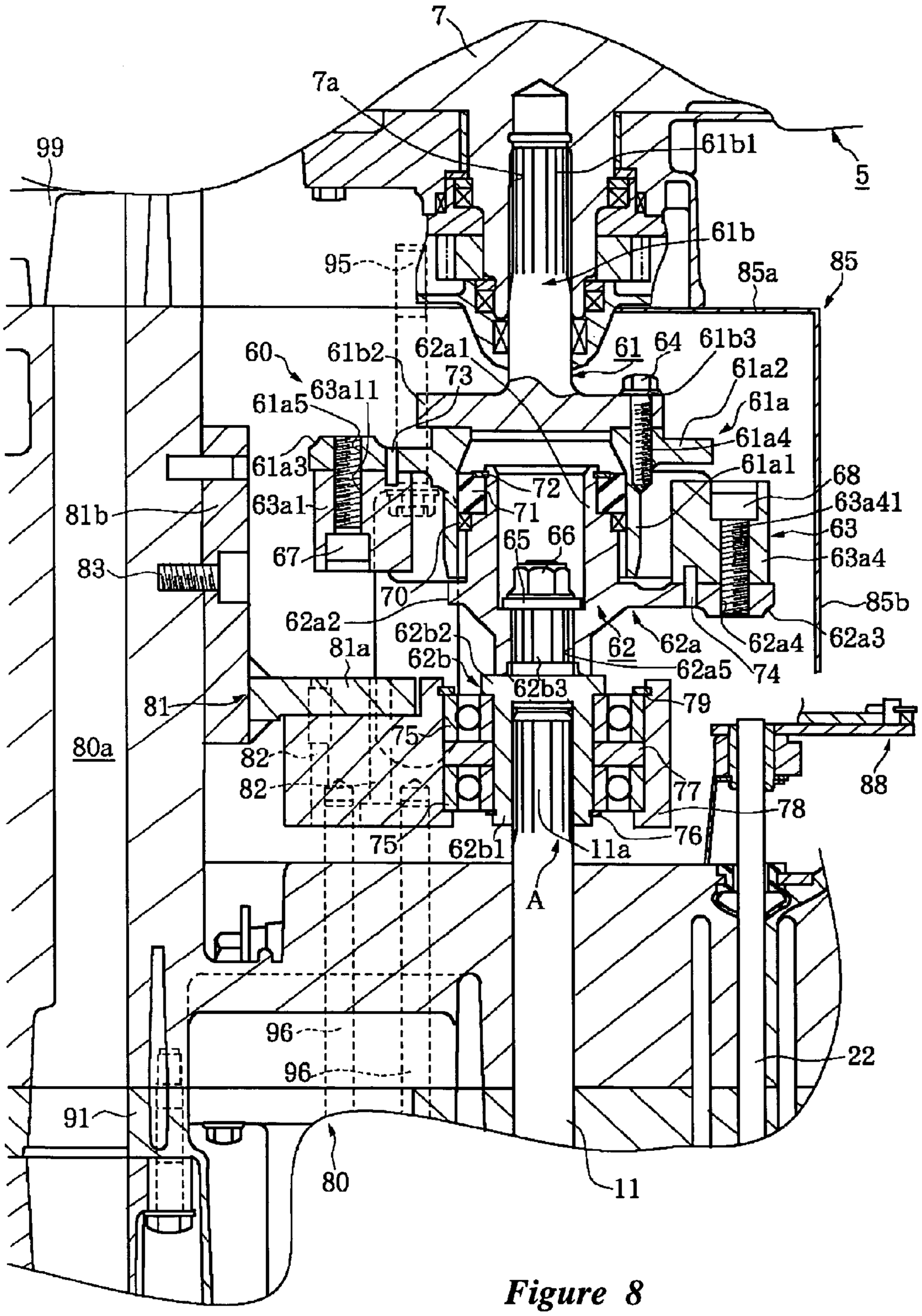
63b2
63b1
63a1
63a11
63

Figure 7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61a3
63a1
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65
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67
83
81b
70
62a2
62b2
62b
62a
62a4
62a5
74
62
81a
81
62b3
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11a
A
96
96
22
91
80
11

Figure 8

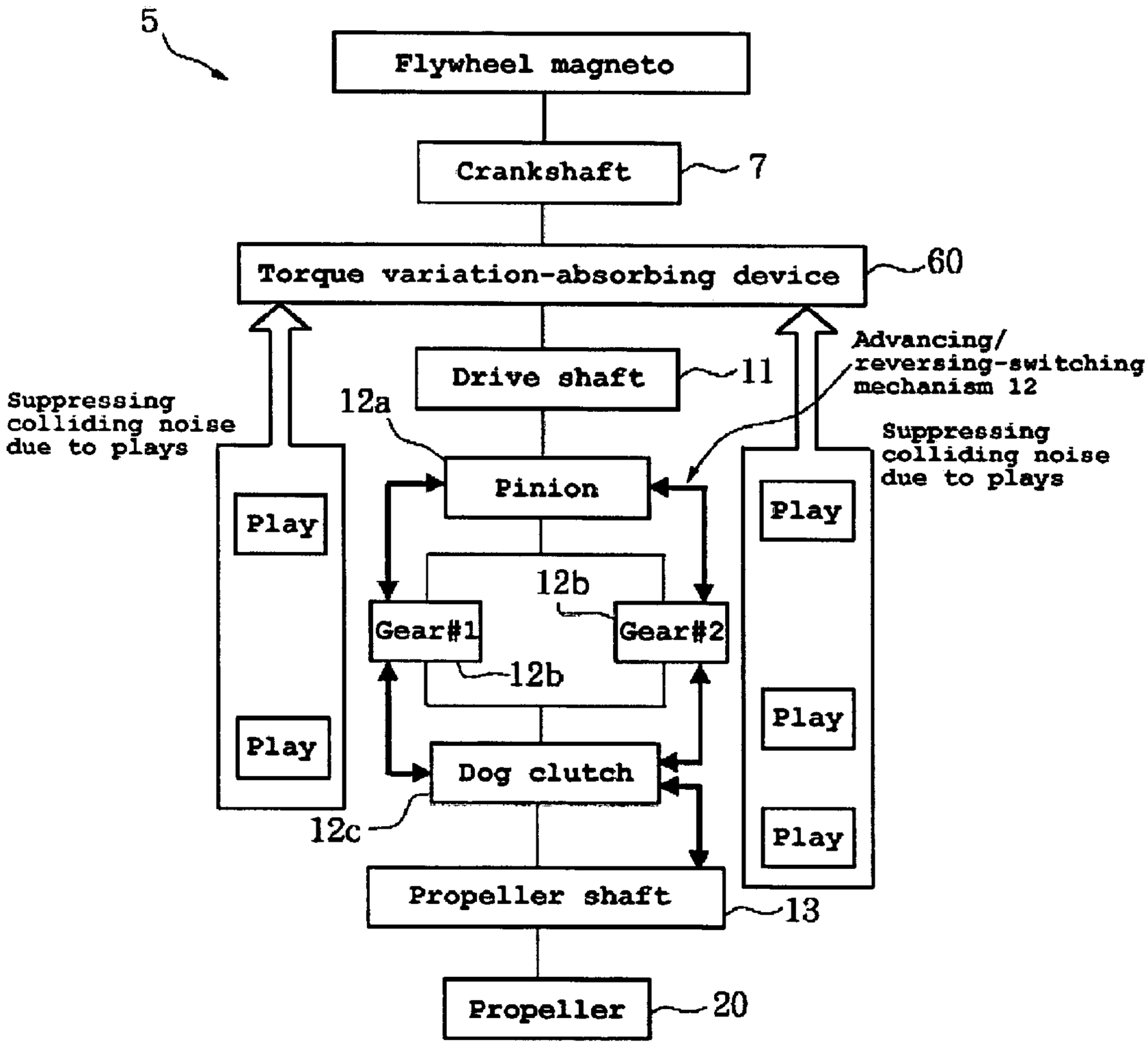

5
Flywheel magneto
Crankshaft
7
Torque variation-absorbing device
60
Drive shaft
11
Advancing/
reversing-switching
mechanism 12
Suppressing
colliding noise
due to plays
12a
Pinion
Play
Play
Play
Play
Play
12b
Gear#1
Gear#2
12b
Dog clutch
12c
Propeller shaft
13
Propeller
20

Figure 9

OUTBOARD MOTOR

PRIORITY INFORMATION

The present application is based on and claims priority under 35 U.S.C. § 119 to Japanese Patent Application Ser. No. 2004-193498, filed Jun. 30, 2004, the entire contents of which is hereby expressly incorporated by reference.

BACKGROUND OF THE INVENTIONS

1. Field of the Inventions

The present inventions relate to an outboard motor mounted, for example, on a small watercraft or the like.

2. Description of the Related Art

Typically, outboard motors include a power transmission mechanism for transmitting rotational power of the crankshaft of an engine to a propeller through a drive shaft. An advancing/reversing-switching mechanism (also known as a forward-reverse-neutral transmission) connects the drive shaft with a propeller shaft and allows the propeller shaft to be shifted between neutral, forward, and reverse thrust modes.

The connections between various components of the drive trains typically used in outboard motors are provided with small clearances, often referred to as mechanical "play" to reduce friction at these connections and for other reasons. As such, the components forming the connections collide with each other at various times. For example, when the transmission is shifted, and when there are variations in the torque output from the engine, these components strike each other.

The collisions between these parts generate noises. These noises are particularly noticeable in large outboard motors such as those including high horse power four-stroke engines. Further, in outboard motors with high horsepower, the passengers of the associated boat can experience unpleasant shocks due to abrupt change in propulsion force produced, for example, at the time of shifting.

Thus, several different designs have been proposed for absorbing shocks, such as those designs in Japanese Patent Nos. JP-A-Sho 60-215495 (P1–P7, FIG. 1–FIG. 13) and JP-A-2000-280983 (P1–P10, FIG. 1–FIG. 13).

Japanese Patent No. JP-A-Sho 60-215495 discloses an arrangement in which a drive shaft is divided into a driving section and a driven section, and a shock absorbing device is disposed between the two sections. Japanese Patent No. JP-A-2000-280983 discloses an arrangement in which either a drive shaft or a propeller shaft is divided into a driving section and a driven section, and a shock absorbing device is disposed between two sections.

SUMMARY OF THE INVENTIONS

An aspect of at least one of the embodiments disclosed herein includes the realization that by supporting a portion of the drivetrain of an outboard motor with a bearing in the vicinity of a torque-variation absorbing device, a more effective torque variation absorbing device can be used. For example, a bearing can provide support to a drive train such that a softer, more compliant absorbing device, such as an absorbing device partially made with rubber or rubber-like materials, can be used in the vicinity of the bearing without sacrificing the integrity of the drivetrain.

Thus, in accordance with an embodiment, an outboard motor comprises an engine having a crankshaft, a drive shaft, an advancing/reversing-switching mechanism, a propeller shaft, a propeller, and a torque variation-absorbing device disposed in a coupling section between the crankshaft and the drive shaft. The torque variation-absorbing device can be supported through a bearing.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side view of an outboard motor mounted on a small watercraft;

FIG. **2** is a sectional view of a torque variation-absorbing device in accordance with an embodiment;

FIG. **3** is a sectional view taken along line III—III of FIG. **2**;

FIG. **4** is a plan view of a bearing block that can be used to support the torque variation-absorbing device;

FIG. **5**(*a*) is a plan view of a flange coupling of a crankshaft-side coupling body;

FIG. **5**(*b*) is a sectional view of the flange coupling of FIG. **5**(*a*) taken along line b—b;

FIG. **6**(*a*) is a plan view of a flange coupling of a drive shaft-side coupling body;

FIG. **6**(*b*) is a sectional view of the a flange coupling of FIG. **6**(*a*) taken along line b—b;

FIG. **7**(*a*) is a plan view of a torque variation-absorbing body;

FIG. **7**(*b*) is a sectional view of the torque variation-absorbing body of FIG. **7**(*a*) taken along line b—b;

FIG. **8** is a sectional view showing the torque variation-absorbing device mounted within the outboard motor; and

FIG. **9** is a schematic block diagram, showing a power transmission mechanism in accordance with an embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Non-limiting embodiments of an outboard motor are described below. These preferred embodiments are not intended to limit the scope of the inventions disclosed herein.

The embodiments disclosed herein are described in the context of a marine propulsion system of a small boat because these embodiments have particular utility in this context. However, the embodiments and inventions herein can also be applied to other marine vessels, such as personal watercraft and small jet boats, as well as other vehicles.

The outboard motor **1** of the illustrated embodiment is attached, through a clamping bracket **2**, to a transom plate **50***a* provided on a hull **50** of a small watercraft (partially shown). An outboard motor body **1**A of the outboard motor **1** is supported on the clamping bracket **2** for up and down pivotal movement about a tilting shaft **3** provided on the clamping bracket **2**.

The outboard motor body **1**A can have a cowling comprising a top cowling **4***a***1** and a lower cowling **4***a***2**. The top cowling **4***a***1** is configured to removable from the lower cowling **4***a***2**. Additionally, the outboard motor body **1**A can include a casing made up of an upper casing **4***b***1** and a lower casing **4***b***2**.

In the upper part of the outboard motor body **1**A, an engine **5** can be housed in the top cowling **4***a***1** and the lower cowling **4***a***2**. The engine **5** can be a four-stroke engine. However, this is merely one type of engine that can be used with the inventions disclosed herein. Engines having any number of cylinders, any cylinder arrangement, any cylinder orientation (e.g., upright cylinder banks, V-type, and W-type), and operating on any combustion principle (e.g.,

two stroke, diesel, and rotary) are all practicable for use with the inventions disclosed herein.

Below the outboard motor body **1**A, a propeller **20** is supported on the lower casing **4***b***2**. Rotational forces from the engine **5** are transmitted to the propeller **20** through a power transmission mechanism **10** housed in the upper casing **4***b***1** and lower casing **4***b***2**.

The engine **5** can have a plurality of cylinders arranged vertically and a crankshaft disposed in the vertical direction, extending downwardly from the engine **5**. The power transmission mechanism **10** can comprises a drive shaft **11**, an advancing/reversing-switching mechanism **12** (a.k.a. forward/neutral/reverse transmission), a propeller shaft **13** and the like.

The drive shaft **11** is coupled to the crankshaft **7** with a torque variation-absorbing device **60**. The drive shaft **11** extends downwardly from the engine **5**. The advancing/reversing-switching mechanism **12** is configured to shift the rotational direction of the drive shaft **11** between forward and reverse. The propeller **20** can be attached to the rear end of the propeller shaft **13** an can be coupled to the advancing/reversing-switching mechanism **12** at the output side.

In the middle of the drive shaft **11** can be provided a water pump **21** driven by the drive shaft **11**. Switching between advancing and reversing in the advancing/reversing-switching mechanism **12** can be accomplished with a shift rod **22**.

With reference to FIG. **2** to FIG. **7**, the torque variation-absorbing device **60** can have a crankshaft-side coupling body **61** spline-fitted in the crankshaft **7**, a drive shaft-side coupling body **62** spline-fitted on the drive shaft **11**, and a torque variation-absorbing body **63** that is disposed between the crankshaft-side coupling body **61** and the drive shaft-side coupling body **62**. However, other arrangements can also be used.

With reference to FIGS. **5**(*a*) and **5**(*b*), the crankshaft-side coupling body **61** can be formed from a metallic material, through a process, such as, but without limitation, forging. The body **61** can have a flange coupling **61***a* and a spline coupling-shaft section **61***b*, as shown in FIG. **2** and FIG. **5**.

The flange coupling **61***a* can have a cylinder portion **61***a***1**, a flange portion **61***a***2** formed at one end of the cylinder portion **61***a***1**, and three flange portions **61***a***3** extending outwardly from the flange portion **61***a***2** at positions angularly spaced by approximately 120°, however, other arrangements and other numbers of flanges can also be used.

The flange portion **61***a***2** can be formed with mounting female screw holes **61***a***4** for the coupling to the spline coupling-shaft section **61***b*, at four locations angularly spaced by approximately 90°, however, other arrangements can also be used. Also, each of the three mounting portions **61***a***3** can be formed with a mounting female screw hole **61***a***5** for the coupling to the torque variation-absorbing body **63**.

The spline coupling-shaft section **61***b* can have a spline shaft portion **61***b***1**, and a flange portion **61***b***2** formed at the end of the spline shaft portion **61***b***1**. The flange portion **61***b***2** can be formed with mounting through-holes **61***b***3** for the coupling to the flange coupling **61***a*, at four locations.

The flange coupling **61***a* and the spline coupling-shaft section **61***b* can be coupled together with four fastening members or bolts **64** each inserted into the mounting through-hole **61***b***3** of the spline coupling-shaft section **61***b* and fitted in the mounting female screw hole **61***a***4** of the flange coupling **61***a* for fixing, although other arrangements and connections can also be used.

With reference to FIGS. **6**(*a*) and **6**(*b*), the drive shaft-side coupling body **62** can be formed from a metallic material by a process such as, for example, but without limitation, forging. The body **62** can have a flange coupling **62***a* and a spline coupling-shaft section **62***b*, as shown in FIG. **2** and FIG. **6**. The flange coupling **62***a* can have a cylinder portion **62***a***1**, a flange portion **62***a***2** formed at the end of the cylinder portion **62***a***1**, and three flange portions **62***a***3** extending outwardly from the flange portion **62***a***2** at positions angularly spaced by approximately 120°, although other arrangements and numbers of flanges can also be used.

Each of the three mounting portions **62***a***3** can be formed with a mounting female screw hole **62***a***4** for the coupling to the torque variation-absorbing body **63**. Also, the cylinder portion **62***a***1** can be formed with a mounting spline hole **62***a***5** for the coupling to the spline coupling-shaft section **62***b*, at its axial center.

The spline coupling-shaft section **62***b* can have a spline bottomed cylinder portion **62***b***1**, a flange portion **62***b***2** formed at the bottom of the spline bottomed cylinder portion **62***b***1**, and a mounting spline shaft portion **62***b***3** formed at the bottom of the spline bottomed cylinder portion **62***b***1** and extending in the axial direction, as shown in FIG. **2**.

The flange coupling **62***a* and the spline coupling-shaft section **62***b* can be coupled together, with the mounting spline shaft portion **62***b***3** of the spline coupling-shaft section **62***b* spline-fitted in a mounting spline hole **62***a***5** of the flange coupling **62***a* and with a nut **66** fastened through a washer **65** to the mounting spline shaft portion **62***b***3** for fixing. However, other arrangements and connections can also be used.

With reference to FIGS. **7**(A) and **7**(*b*), the torque variation-absorbing body **63** can be made up of insert metals and rubber members, having six insert metals **63***a***1**–**63***a***6** and six rubber members **63***b***1**–**63***b***6**, as shown in FIG. **2** and FIG. **7**. However, other arrangements and numbers of insert metals and rubber members can also be used.

The six insert members **63***a***1**–**63***a***6** can be located at the corners of an equilateral hexagon, respectively, as shown in FIG. **7**, although other arrangements can also be used. The six rubber members **63***b***1**–**63***b***6** can each be coupled to their respective insert metals **63***a***1**–**63***a***6**, so that the torque variation-absorbing body **63** can be formed in the annular shape of an equilateral hexagon.

Of the insert metals **63***a***1**–**63***a***6**, the insert metals **63***a***2**, **63***a***4**, **63***a***6** can each be disposed so as to be offset by a distance D**1**. The non-offset insert metals **63***a***1**, **63***a***3**, **63***a***5** can be formed with mounting through-holes **63***a***11**, **63***a***31**, **63***a***51** for the mounting to the flange coupling **61***a*.

The offset insert metals **63***a***2**, **63***a***4**, **63***a***6** can be formed with mounting through-holes **63***a***21**, **63***a***41**, **63***a***61** for the mounting to the flange coupling **62***a*, respectively. The torque variation-absorbing body **63** can be disposed between the crankshaft-side coupling body **61** and the drive shaft-side coupling body **62**. Regarding the drive shaft-side coupling body **62**, an oil seal **70** and a bushing **71** can be supported on the cylinder portion **62***a***1** of the flange coupling **62***a* by a circlip **72**, and the cylinder portion **62***a***1** can be fitted in the cylinder portion **61***a***1** of the flange coupling **61***a* to assemble the crankshaft-side coupling body **61** and the drive shaft-side coupling body **62**.

Regarding the torque variation-absorbing body **63** and the crankshaft-side coupling body **61**, the insert metals **63***a***1**, **63***a***3**, **63***a***5** can be assembled to the three mounting portions **61***a***3** of the flange coupling **61***a* through spring pins **73**. Crankshaft-side fastening members **67** can be inserted in the mounting through-holes **63***a***11**, **63***a***31**, **63***a***51** to be screwed in the female screw holes **61***a***5** for fixing.

Regarding the torque variation-absorbing body **63** and the drive shaft-side coupling body **62**, the insert metals **63***a***2**,

63*a*4, 63*a*6 of the torque variation absorbing body **63** can be assembled to the three mounting portions **62***a***3** of the flange coupling **62***a* through spring pins **74**. Crankshaft-side fastening members **68** can be inserted in the mounting through-holes **63***a***21**, **63***a***41**, **63***a***61** to be screwed in the female screw holes **62***a***4** for fixing.

As described above, since the torque variation-absorbing body **63** can be fastened fixedly to the crankshaft-side coupling body **61** and the drive shaft-side coupling body **62**, easy and firm integration can be effected without using a special fixing structure.

In the drive shaft-side coupling body **62**, two bearings **75** can be supported on the spline bottomed cylinder portion **62***b***1** of the spline coupling-shaft section **62***b* by a circlip **76**. A collar **77** can be disposed between the two bearings **75**.

On the two bearings **75**, a bearing holder **78** can be held by a circlip **79**. Thus, the torque variation-absorbing device **60** and the bearings **75** can be assembled in advance and arranged as a torque variation-absorbing unit A, thereby providing easy assembly between the engine **5** and the guide exhaust **90** or between the guide exhaust **90** and the upper casing **4***b***1**.

In this torque variation-absorbing unit A, the spline shaft portion **61***b***1** of the spline coupling-shaft section **61***b* can be spline fitted into the spline hole section **7***a* of the crankshaft **7**, the spline bottomed cylinder portion **62***b***1** of the spline coupling-shaft section **62***b* can be spline-fitted on the drive shaft **11** at the spline upper end **11***a* thereof, and the bearing holder **78** can be disposed so as to be attached to a bracket **81** of a block **80**.

The bracket **81** can have a bearing holder-mounting portion **81***a* and a block-mounting portion **81***b*, as shown in FIG. **2** and FIG. **3**. The bearing holder-mounting portion **81***a* and the bearing holder **78** of the bracket **81** can be fastened fixedly with bolts **82**. The block-mounting portion **81***b* and the block **80** can be fastened fixedly with bolts **83**. As such, the bearings **75** can be fixed relative to the crankcase **99** while rotatably supporting the driveshaft **11**.

The block **80** can be disposed between the engine **5** and the guide exhaust member **90**, as shown in FIG. **2** and FIG. **3**. Onto the top side of the block **80** can be fastened fixedly a crankcase **99** with bolts **95**. Below the block **80**, the guide exhaust **90** and an exhaust box **91** can be mounted with bolts **96**.

The block **80** can be provided with an exhaust gas passage **80***a*, a cooling water passage **80***b*, a supply-lubricating oil passage **80***c* and a return-lubricating oil passage **80***d*, as shown in FIG. **3** and FIG. **4**. The guide exhaust **90** can be provided with an exhaust gas passage **90***a*, a cooling water passage **90***b*, a supply-lubricating oil passage **90***c* and a return-lubricating oil passage **90***d*, as shown in FIG. **2** and FIG. **3**.

The exhaust gas passage **80***a*, cooling water passage **80***b*, supply-lubricating oil passage **80***c* and return-lubricating oil passage **80***d* in the block **80** can be in communication with the exhaust gas passage **90***a*, cooling water passage **90***b*, supply-lubricating oil passage **90***c* and return-lubricating oil passage **90***d* of the guide exhaust **90**, respectively. Thus, various kinds of passages can be formed in the block **80**, thereby providing easy communication between these various kinds of passages.

In addition, a cover **85** for covering the torque variation-absorbing device **60** can be fastened fixed to the block **80** with bolts **86**, as shown in FIG. **2** and FIG. **4**. The cover **85** can have a portion **85***a* covering the upper side of the torque variation-absorbing device and a portion **85***b* covering half the side thereof, and opens downwardly.

A recessed portion **80***e* of the block **80** can cover approximately a half of the torque variation-absorbing device **60** in the lateral direction. The cover **85** can be configured to cover the torque variation-absorbing device **60** from the upper side and approximately half of the device **60** in the lateral direction, as viewed in FIG. **4**. As such, the cover **85** can prevent electric wires or the like from contacting the torque variation-absorbing device **60**.

The block **80** can be supported on the upper casing **4***b***1** and the bearings **75** can be mounted to the block **80** through the bearing holder **78** and bracket **81**. As such, the block **80** allows easy formation of various kinds of passages and a simple mounting structure.

Further, the guide exhaust **90** can be arranged such that it can be formed like a block, with one portion extending upwardly. The bearings **75** can be mounted to the guide exhaust **90** in the same construction. The guide exhaust **90** can be supported on the upper casing **4***b***1**. Utilizing the guide exhaust **90** allows simple and reliable mounting of the bearings **75**.

In this embodiment, as shown in FIG. **9**, a flywheel magneto can be provided above the crankshaft **7** of the engine **5**. During operation, rotational power of the crankshaft **7** can be transmitted to the propeller **20** through the torque variation-absorbing device **60**, drive shaft **11**, advancing/reversing-switching mechanism **12** and propeller shaft **13**. The advancing/reversing-switching mechanism **12** can have a pinion **12***a*, gears **12***b* and a dog clutch **12***c*. Although mechanical play still exists between the various parts of the power transmission mechanism from the drive shaft **11** to the propeller shaft **13** and torque variations are produced during engine operation, the torque variations and vibrations from collisions can be absorbed by the torque variation-absorbing body **63** of the torque variation-absorbing device **60**. As such, the noise of colliding parts can be reduced. Further, riders will experience less unpleasant shocks.

In this embodiment, as shown in FIG. **9**, since the torque variation-absorbing device **60** can be disposed in a coupling section between the crankshaft **7** and drive shaft **11** and the coupling section of the power transmission mechanism can be utilized to dispose the torque variation-absorbing device **60**, a simple structure can be obtained without need of dividing the drive shaft **11**, for example. In addition, the section where torque variations can be absorbed can be supported reliably through bearings **75**. As such, collision noises of the power transmission mechanism can be reduced and unpleasant shock feelings transmitted to riders can be reduced.

Further, as described above, the torque variation-absorbing device **60** can be disposed between the crankshaft **7** and the drive shaft II, so that the space under the engine can be utilized to dispose a shift operation member **88** or the like without interference. Furthermore, since the torque variation-absorbing device **60** can be located above the drive shaft **11**, its assembly or maintenance can be performed easily from the engine side.

The torque variation-absorbing device **60** comprises a torque variation-absorbing body **63**, a crankshaft-side coupling body **61** and a drive shaft-side coupling body **62**, providing a simple structure in which the coupling section of the crankshaft **7** and the drive shaft **11** can be utilized to dispose the torque variation-absorbing device **60**. Further, the drive shaft-side coupling body **62** located below the torque variation-absorbing device **60** can be supported reliably by the bearings **75**.

Although these inventions have been disclosed in the context of certain preferred embodiments and examples, it

will be understood by those skilled in the art that the present inventions extend beyond the specifically disclosed embodiments to other alternative embodiments and/or uses of the inventions and obvious modifications and equivalents thereof. In addition, while several variations of the inventions have been shown and described in detail, other modifications, which are within the scope of these inventions, will be readily apparent to those of skill in the art based upon this disclosure. It is also contemplated that various combination or sub-combinations of the specific features and aspects of the embodiments may be made and still fall within the scope of the inventions. It should be understood that various features and aspects of the disclosed embodiments can be combined with or substituted for one another in order to form varying modes of the disclosed inventions. Thus, it is intended that the scope of at least some of the present inventions herein disclosed should not be limited by the particular disclosed embodiments described above.

What is claimed is:

1. An outboard motor comprising an engine having a crankshaft, a drive shaft, an advancing/reversing-switching mechanism, a propeller shaft, a propeller, a torque variation-absorbing device disposed in a coupling section between the crankshaft and the drive shaft, wherein the torque variation-absorbing device is supported through a bearing, wherein the bearing is mounted to a block having an exhaust gas passage, a cooling water passage and a lubricating oil passage, and the block is disposed between the crankshaft and the drive shaft.

2. An outboard motor comprising an engine having a crankshaft, a drive shaft, an advancing/reversing-switching mechanism, a propeller shaft, a propeller, a torque variation-absorbing device disposed in a coupling section between the crankshaft and the drive shaft, wherein the torque variation-absorbing device is supported through a bearing, wherein the torque variation-absorbing device includes a crankshaft-side coupling body that is spline-fitted to the crankshaft, a drive shaft-side coupling body that is spline-fitted to the drive shaft, and a torque variation-absorbing body that is disposed between the crankshaft-side coupling body and the drive shaft-side coupling body, wherein the bearing is mounted to a block having an exhaust gas passage, a cooling water passage and a lubricating oil passage, and the block is disposed between the crankshaft and the drive shaft.

3. An outboard motor comprising an engine having a crankshaft, a drive shaft, an advancing/reversing-switching mechanism, a propeller shaft, a propeller, a torque variation-absorbing device disposed in a coupling section between the crankshaft and the drive shaft, wherein the torque variation-absorbing device is supported through a bearing, wherein the torque variation-absorbing device includes a crankshaft-side coupling body that is spline-fitted to the crankshaft a drive shaft-side coupling body that is spline-fitted to the drive shaft, and a torque variation-absorbing body that is disposed between the crankshaft-side coupling body and the drive shaft-side coupling body, wherein the torque variation-absorbing body is fastened fixedly to the crankshaft-side coupling body with crankshaft-side fastening members and to the drive shaft-side coupling body with drive shaft-side fastening members, wherein the bearing is mounted to a block having an exhaust gas passage, a cooling water passage and a lubricating oil passage, and the block is disposed between the crankshaft and the drive shaft.

4. An outboard motor comprising an engine having a crankshaft, a drive shaft, an advancing/reversing-switching mechanism, a propeller shaft, a propeller, a torque variation-absorbing device disposed in a coupling section between the crankshaft and the drive shaft, wherein the torque variation-absorbing device is supported through a bearing, wherein the torque variation-absorbing device includes a crankshaft-side coupling body that is spline-fitted to the crankshaft, a drive shaft-side coupling body that is spline-fitted to the drive shaft, and a torque variation-absorbing body that is disposed between the crankshaft-side coupling body and the drive shaft-side coupling body, wherein the torque variation-absorbing body is fastened fixedly to the crankshaft-side coupling body with crankshaft-side fastening members and to the drive shaft-side coupling body with drive shaft-side fastening members, wherein the drive shaft-side coupling body is supported through a bearing, wherein the bearing is mounted to a block having an exhaust gas passage, a cooling water passage and a lubricating oil passage, and the block is disposed between the crankshaft and the drive shaft.

5. An outboard motor comprising an engine having a crankshaft, a drive shaft, an advancing/reversing-switching mechanism, a propeller shaft, a propeller, a torque variation-absorbing device disposed in a coupling section between the crankshaft and the drive shaft, wherein the torque variation-absorbing device is supported through a bearing, wherein the bearing is mounted to an exhaust guide having an exhaust gas passage, a cooling water passage and a lubricating oil passage.

6. An outboard motor comprising an engine having a crankshaft, a drive shaft, an advancing/reversing-switching mechanism, a propeller shaft, a propeller, a torque variation-absorbing device disposed in a coupling section between the crankshaft and the drive shaft, wherein the torque variation-absorbing device is supported through a bearing, wherein the torque variation-absorbing device includes a crankshaft-side coupling body that is spline-fitted to the crankshaft, a drive shaft-side coupling body that is spline-fitted to the drive shaft, and a torque variation-absorbing body that is disposed between the crankshaft-side coupling body and the drive shaft-side coupling body, wherein the bearing is mounted to an exhaust guide having an exhaust gas passage, a cooling water passage and a lubricating oil passage.

7. An outboard motor comprising an engine having a crankshaft, a drive shaft, an advancing/reversing-switching mechanism, a propeller shaft, a propeller, a torque variation-absorbing device disposed in a coupling section between the crankshaft and the drive shaft, wherein the torque variation-absorbing device is supported through a bearing, wherein the torque variation-absorbing device includes a crankshaft-side coupling body that is spline-fitted to the crankshaft, a drive shaft-side coupling body that is spline-fitted to the drive shaft, and a torque variation-absorbing body that is disposed between the crankshaft-side coupling body and the drive shaft-side coupling body, wherein the torque variation-absorbing body is fastened fixedly to the crankshaft-side coupling body with crankshaft-side fastening members and to the drive shaft-side coupling body with drive shaft-side fastening members, wherein the bearing is mounted to an exhaust guide having an exhaust gas passage, a cooling water passage and a lubricating oil passage.

8. An outboard motor comprising an engine having a crankshaft, a drive shaft, an advancing/reversing-switching mechanism, a propeller shaft, a propeller, a torque variation-absorbing device disposed in a coupling section between the crankshaft and the drive shaft, wherein the torque variation-absorbing device is supported through a bearing, wherein the torque variation-absorbing device includes a crankshaft-side coupling body that is spline-fitted to the crankshaft, a drive shaft-side coupling body that is spline-fitted to the drive shaft, and a torque variation-absorbing body that is

disposed between the crankshaft-side coupling body and the drive shaft-side coupling body, wherein the torque variation-absorbing body is fastened fixedly to the crankshaft-side coupling body with crankshaft-side fastening members and to the drive shaft-side coupling body with drive shaft-side fastening members, wherein the drive shaft-side coupling body is supported through a bearing, wherein the bearing is mounted to an exhaust guide having an exhaust gas passage, a cooling water passage and a lubricating oil passage.

9. An outboard motor comprising an engine having a crankshaft, a drive shaft, an advancing/reversing-switching mechanism, a propeller shaft a propeller, a torque variation-absorbing device disposed in a coupling section between the crankshaft and the drive shaft, wherein the torque variation-absorbing device is supported through a bearing, wherein the torque variation-absorbing device includes a crankshaft-side coupling body that is spline-fitted to the crankshaft, a drive shaft-side coupling body that is spline-fitted to the drive shaft, and a torque variation-absorbing body that is disposed between the crankshaft-side coupling body and the drive shaft-side coupling body, wherein the torque variation-absorbing body is fastened fixedly to the crankshaft-side coupling body with crankshaft-side fastening members and to the drive shaft-side coupling body with drive shaft-side fastening members, wherein the drive shaft-side coupling body is supported through a bearing, wherein the torque variation-absorbing device and the bearing are assembled as a torque variation-absorbing unit, wherein the bearing is mounted to an exhaust guide having an exhaust gas passage, a cooling water passage and a lubricating oil passage.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 7,238,070 B2
APPLICATION NO. : 11/172178
DATED : July 3, 2007
INVENTOR(S) : Ken Asakaze

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

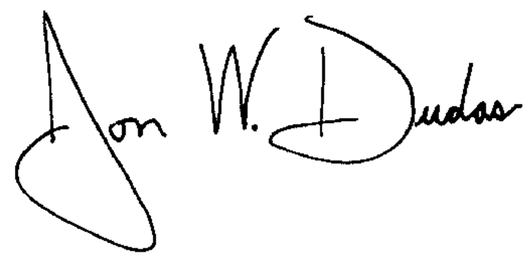
Title Page; item (57);
At page 1, column 2 (Abstract), line 1, please delete "ca**m**" and insert -- ca**n** --, therefor.

At column 7, line 52, in Claim 3, please delete "crankshaft" and insert -- crankshaft**,** --, therefor.

At column 9, line 12, in Claim 9, please delete "shaft" and insert -- shaft**,** --, therefor.

Signed and Sealed this

Twenty-ninth Day of July, 2008



JON W. DUDAS
Director of the United States Patent and Trademark Office